Platelet Count and Mean Platelet Volume in Patients with Nasal Polyposis

Nazal Polipli Hastalarda Trombosit Sayısı ve Ortalama Trombosit Hacmi

Platelet and Mean Platelet Volume

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Özet

Giriş: Nazal polip, nazal obstrüksiyonun en sık nedenlerinden olup prevalansı %1-4 arasında değişmektedir. Etyolojisi tam olarak bilinmemekle birlikte kronik enfeksiyonların, mekanik, immünolojik ve biyokimyasal faktörlerin etyolojide rol oynadığı düşünülmektedir. Son zamanlarda ortalama trombosit hacmi inflamatuar hastalıklarda basit inflamatuar bir markır olarak kabul edilmektedir. Bu çalışmanın amacı nazal polipli hastalarda trombosit sayısı ve ortalama trombosit hacmini araştırmaktır. Gereç ve Yöntem: Histopatolojik olarak kanıtlanmış nazal polipli 80 hasta ile yaşı ve cinsiyeti birbirine yakın 80 sağlıklı kontrol grubu çalışmaya dahil edildi. Nazal polipli hasta grubunda paranazal sinüs BT'leri Lund-Mackay evreleme sistemine göre değerlendirildi ve hesaplandı. Nazal polipli hasta grubu ile kontrol grubu arasında ortalama trombosit hacmi, trombosit sayısı, trombosit krit ve trombosit dağılım genişliği açısından anlamlı farklılık olup olmadığı istatistiksel olarak değerlendirildi. Bulgular: Nazal polipli hastalarda ortalama trombosit hacmi (8.57±1.62 fL vs 8.79±1.49fL, p=0.38) ve trombosit sayısı (259.99±62.03 x103/µL vs 270.29±61.82 x103/µL, p=0.26) kontrol grubu ile karşılaştırıldığında düşük saptanmış olup istatistiksel olarak anlamlı bulunmadı. Trombosit dağılım genişliği ise nazal polipli hastalarda (17.1±1.36 fL), kontrol grubu (16.78±1.04 fL) ile karşılaştırıldığında hafif yüksek bulunmuş olmakla birlikte istatistiksel olarak anlamlı bulunmadı (p=0.075). Ancak trombosit krit değeri nazal polipli hastalarda (0.21±0.065), kontrol grubu ile karşılaştırıldığında (0.23±0.069) düşük ve istatistiksel olarak anlamlı bulundu (p=0.044). Tartışma: Bizim çalışmamızda trombosit sayısı ve ortalama trombosit hacmi NP'li hastalarda düşük saptanmış olup istatistiksel olarak anlamlı farklılık bulunmamıştır. Bizim bulgularımıza göre nazal polipli hastalarda ortalama trombosit hacminin inflamatuar bir markır olarak kullanılması çok da güvenilir değildir.

Anahtar Kelimeler

Bilgisayarlı Tomografi; Ortalama Trombosit Hacmi; Nazal Polip; Trombosit; Trombosit Dağılım Genişliği

Abstract

Aim: Nasal polyps (NPs) are the most common reason for nasal obstruction, with a prevalence of 1-4%. Although the etiology is not clearly known, chronic infections and mechanical, immunological, and biochemical factors can play a role in the etiology. Recently, mean platelet volume (MPV) was recognized as a simple inflammatory marker in the inflammatory disease. In this study, we aimed to evaluate platelet (PLT) and MPV in patients with NPs. Material and Method: This study included 80 histopathologically proven patients with NPs and 80 age- and sex-matched healthy subjects as controls. The Lund-Mackay staging system was used to evalute paranasal sinus CT scans, in patients with NPs, and paranasal sinus CT scores were recorded. Values of MPV, platelet (PLT), platelet crit (PCT) and platelet distribution width (PDW) were assessed in NP and control groups. Results: MPV and PLT values were found to be low in patients with NPs, at 8.57±1.62 fL and 259.99±62.03 x103/µL, respectively, compared with the control groups, at 8.79±1.49fL and 270.29±61.82 x103/µL. These findings were not statistically significant. PDW values were found to be slightly high in patients with NPs, at 17.1±1.36 fL, compared with the control group, at 16.78±1.04 fL (p=0.075). But PCT values were found to be low in patients with NPs, at 0.21±0.065, compared with the control group, at 0.23±0.069 (p=0.044). This finding was statistically significant. Discussion: In our study, the MPV and PLT values were lower in patients with NPs, but the difference was not statistically significant. According to our findings, the use of MPV as an inflammation marker in patients with NPs does not seem to be reliable.

Keywords

Computed Tomography; Mean Platelet Volume; Nasal Polyp; Platelet; Platelet Distribution Width

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Introduction

Nasal polyps (NPs) are a benign mucosal disorder as a result of mucosal inflammation that originates from any portion of the nasal mucosa or paranasal sinuses [1]. It is the most common non-neoplastic lesion in the nasal cavity. It also is a very common cause of chronic nasal obstruction [2]. In the general population, the overall prevalence rate of NPs ranges from 1-4% [3]. It is at least two times higher in men than in women. Adults are more commonly affected, especially those age 20 and older [1]. It is a multifactorial disease with unclear etiology. Allergy, chronic infections and mechanical, immunological, and biochemical factors can play a role in the etiology. Mucosal edema is the primary pathology in the development of NPs. It is a kind of inflammation induced by chemical mediators, cytokines and growth factors released from inflammatory cells and endothelial receptors [3].

The importance of inflammatory mediators, cytokines, prolonged lifespan of eosinophils, increased activity of the arachidonic acid metabolism and oxidative stress in the etiopathogenesis of NPs were revealed in several studies [4-6]. Recent studies have demonstrated the role of platelets in chemotaxis, releasing various chemokines and cytokines as inflammatory cells [7]. Mean platelet volume (MPV) is the most commonly used measure of platelet size. MPV is an indirect indicator for platelet functions and readily measured by clinical hematology analyzers. Larger platelets have more dense granules and are metabolically and enzymatically more active than small platelets [8]. In this study, we aimed to evaluate platelet (PLT) and MPV in patients with NPs compared with healthy control groups.

Material and Method

This study was approved by the institutional review board and the ethics committee of Samsun Education and Research Hospital and complied with the Declaration of Helsinki. We retrospectively reviewed the paranasal computed tomography (CT) images of 80 histolopathologically proven cases of NPs. The data of 80 age-matched, healthy individuals with normal paranasal sinus CT without marked nasal septum deviation were evaluated as the control group. Patients with trombocytopenia and any chronic underlying diseases (including cardiovascular disorders, malignancy, asthma, cystic fibrosis, metabolic disease, and kidney or liver disease) were excluded from the study. The Lund-Mackay staging (LMS) system was used to assess paranasal sinus CT scans. In this system, the right or left sinuses were respectively divided into six portions: maxillary sinus, anterior ethmoid sinuses, posterior ethmoid sinuses, sphenoid sinus, frontal sinus, and ostiomeatal complex. This system relies on a score of 0-2, depending on the absence of, or partial or complete opacification of each sinus system. In addition, the ostiomeatal complex was scored as either 0 (not obstructed) or 2 (obstructed). The 10 scores for the various sinuses and bilateral ostiomeatal complexes were added up to give a bilateral total LMS that could range from 0 (all sinuses completely clear) to 24 (complete opacification of all sinuses). In addition, unilateral five portions of the sinuses from either the left or the right and one ipsilateral ostiomeatal complex were also added up to give separate unilateral total LMS values that could range from 0 to 12 [9].

Blood samples were collected from veins in the antecubital fossa one day before the operation in the morning after a fasting period of 12 hours and placed in standardized tubes containing dipotassium ethylenediaminetetraacetic acid (EDTA). Total blood count analyses were performed by using a Mindray BC 6800 (Shenzhen, China) autoanalyzer. PLT, MPV, platelet distribution width (PDW) ve platelet crit (PCT) parameters were assessed. The reference values for PLT in our laboratory ranged between 150 to 400 103/μL, for MPV 6 to 11 femtolitres (fL), for PDW 15 to 17 femtolitres (fL) and for PCT 0.1-0.3 %.

Statistical analysis

The SPSS statistical software package (SPSS, version 20 for Windows; SPSS Inc., Chicago, Illinois, USA) was used to perform all statistical calculations.

A Student's t-test was used for the statistical comparison of data that match normal distribution, and the Mann-Whitney U test was used for the statistical comparison of the groups when data were not distributed normally.

Spearman's Correlation testing was used to evaluate the association between MPV and total paranasal sinus CT scores. Multiple linear regression analysis was used for determination of the prognostical factors that may impact the MPV values.

$P < 0.05$ was considered significant in all statistical analysis. All data were expressed as mean ± SD.

Results

The NP group consists of 80 patients, with 50 males and 30 females, with a mean age of 41.04±14.5 years. The control group is consists of 80 healty subjects: 45 male and 35 female patients, with a mean age of 38.8±14.8 years. There was no significant difference between the two groups regarding age and gender distribution (Table 1).

Mean white blood count (WBC) values were 7.89±1.93x103/μL in patients with NPs, vs. 8.11±2.44x103/μL in the control group. There were no significant differences in WBC values between the two groups (p=0.85) (Table 1).

Mean haemoglobin (Hb) values were 15.4±1.50 g/dL in patients with NPs, vs. 14.09±1.31 g/dl in the control group. There were no significant differences in Hb values between the two groups (p=0.37) (Table 1).

Mean MPV values were 8.57±1.6 fL in patients with NPs, vs. 8.79±1.49 fL in the control group. There were no significant differences in MPV values between two groups (p=0.38) (Table 1).

Mean PLT values were 259.99±62.03x103/μL in patients with NPs, vs. 270,29±61.82x103/μL in the control group. There was no significant differences in PLT values between the two groups (p=0.26) (Table 1).

PDW values were 17.1±1.36 fL in patients with NPs, vs. 16.78±1.0 fL in the control group. There were no significant differences in PDW values between the two groups (p=0.075) (Table 1).

PCT values were 0.21±0.065 in patients with NPs, vs. 0.23±0.069 in the control group. There was a significant difference in PCT values between the two groups (p=0.044) (Table 1).

NPs in 71.3% of patients were bilateral (n = 57) and 28.8% in patients were unilateral (n = 23), respectively. In men, 82% were bilateral (n=41), and 18% were unilateral (n=9). In women,

Table 1. Laboratory findings of the study groups

	Grup	Mean	Std. Deviation	p
Age, years	Control	38,83	14,825	0,342
	Nasal Polyp	41,04	14,521	
WBC count, x103/µL	Control	8,1176	2,44226	0,858
	Nasal Polyp	7,8983	1,93107	
Hb level, g/dL	Control	14,090	1,3137	0,370
	Nasal Polyp	15,435	1,5027	
MPV level, fL	Control	8,794	1,4944	0,383
	Nasal Polyp	8,578	1,6285	
PLT, x103/µL	Control	270,29	61,825	0,266
	Nasal Polyp	259,99	62,037	
PDW, fL	Control	16,781	1,0452	0,075
	Nasal Polyp	17,159	1,3618	
PCT, %	Control	,2355	,06970	0,044*
	Nasal Polyp	,2164	,06526	

Abbreviations: Hb: Haemoglobin; WBC: White blood cell; PLT: Platelet; PCT: Platelet crit; PDW: Platelet distribution width; MPV: Mean platelet volume
*p<0.05

53.3% were bilateral (n = 16), and 46.7% were unilateral (n = 14) (Figure 1).

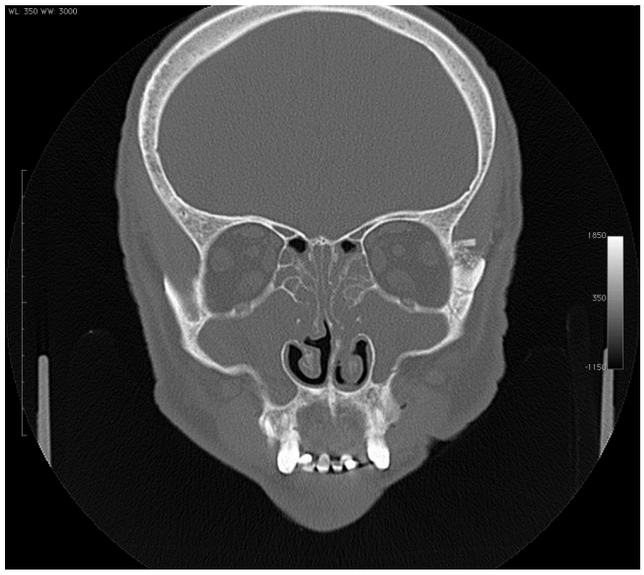

Figure 1. A coronal CT scan shows bilateral complete opacification of the ethmoid and maxillary sinuses, with inflammatory tissues and polyps obliterating the ostiomeatal unit.

The right total LMS was 3.31±0.35, the left total LMS was 3.13±0.35, and bilateral total LMS was 6.44±0.67, with a range of 0-12 in the NP group. When a correlation test was performed, MPV was negatively correlated with total paranasal sinus CT scores (Rs= -0,175) (p=0,121>0,05). Also, MPV was independent from age, WBC, Hb and PDW, while it was negatively correlated to PLT (Rs= -0.031±0.001, p<0.05) and positively correlated to PCT (Rs=30.79±1.27, p<0.05) (Table 2).

Table 2. Linear regression analysis of factors influencing MPV

	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std.Error	Beta		
(Constant)	10,701	0,939		11,402	0,000
Age	-0,003	0,004	-0,027	-0,745	0,458
WBC	0,029	0,027	0,040	1,071	0,286
Hb	-0,001	0,007	-0,005	-0,124	0,901
PLT	-0,031	0,001	-1,216	-21,863	0,000
PCT	30,792	1,270	1,340	24,244	0,000
PDW	-0,056	0,049	-0,044	-1,151	0,251

Abbreviations: Hb: Haemoglobin; WBC: White blood cell; PLT: Platelet; PCT: Platelet crit; PDW: Platelet distribution width; MPV: Mean platelet volume
(R2 =0,811, Adj R2 =0,804, D.W.=1,95, SD: 0,692)

Discussion

Nasal obstruction is a commonly encountered complaint in otolaryngology practices, and the etiologies of nasal obstruction vary, such as nasal septal deviation, nasal polyposis, sinonasal mucosal inflammation, and space-occupying lesion or lesions. Nasal obstruction depends on their location, size and number of nasal polyps. Patients usually have profuse nasal discharge and congestion, and complain of rhinorrhea or postnasal drip. Also, they may complain about sneezing, headache, cough, fever, sore throat, anosmia and hiposmia [1]. They can see pale, gray, single or multiple polypoid lesions frequently arising from the middle meatus to the nasal cavity by anterior and posterior rhinoscopy. NPs are almost always bilateral; if they're unilateral, histopathological examination should be performed to exclude malignancies and other pathologies, such as inverted papilloma [1]. Plain radiography has limited usefulness in sinonasal imaging and is especially ineffective in detecting ethmoid disease. It can, however, show opacification of the affected sinuses. CT scans are the most common modality for sinus imaging, and give detailed information about both bone and soft-tissue structures. A CT scan can show partial or complete opacification of the affected sinus and obstruction of the osteomeatal unit.

NPs can lead to recurrent and chronic nasal obstruction. Chronic nasal obstruction can increase upper airway resistance and may lead to alveolar hypoventilation, which results in hypoxia and hypercapnia [8]. In studies, biochemical mediators and free radicals have been shown to increase in patients with nasal polyposis [10, 11]. Platelets are vital components of normal hemostasis, and they can release several inflammatory cytokines [12]. Platelets undergo shape and size changes when activated. Platelet functions are related to size: Larger platelets have a greater mass, denser granules, and are more active enzymatically and metabolically [13]. MPV is a machine-calculated measurement of the average size of PLTs. It also shows the activation of PLTs. Recent studies show that MPV is increased in Crohn's disease, rheumatoid arthritis, familial Mediterranean fever, ulcerative colitis, diabetes, acute pancreatitis and acute ischemic stroke patients [14-19]. MPV nowadays is used as an inflammatory marker in patients with inflammatory disease [20]. Sagit and colleagues reported that MPV levels are significantly higher in patients with NPs compared with the control group. Also, they reported that there was no significant correlation between MPV and paranasal sinus CT scores [8]. Aktas and colleagues revealed that MPV levels were significantly lower in patients with NPs when compared with the normal control group [22]. Cevik et al revealed that MPV levels were

significantly lower in patients with NPs when compared with the normal control group as well [3]. In our study, MPV and PLT values were low in patients with NPs compared with the control group. Also, there was no significant difference in MPV and PLT values between two groups. PDW values in patients with NPs were higher than the control group. Also, there was no significant differences in PDW values between the two groups as well. However, PCT values in patients with NPs were lower than the control group and were identified as statistically significant ($p = 0.044$).

Sagit et al reported that there was no significant correlation between paranasal sinus CT scores and MPV values [21]. However, in our study, we detected very poor negative correlation between paranasal sinus CT scores and MPV values. Cevik et al reported that MPV was negatively correlated with PLT [3]. In our study, we found that MPV was significant statistically and negatively correlated with PLT and insignificant statistically and positively correlated with PCT. Also, a correlation test has shown that MPV was independent of age, Hb and WBC.

There was a limitation in our study. MPV values in patients with NPs were not evaluated after the operation.

Conclusion

In our study, the MPV and PLT values were lower in patients with NPs, but were not statistically significant. MPV and PLT values, which are used as a marker for inflammation, are still controversial. According to our findings, the use of MPV as an inflammation marker in patients with NPs does not seem to be reliable.

Competing interests

The authors declare that they have no competing interests.

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